

Fig. 1A

Influenza matrix: wild type gene (for comparison)

agatctaaagatgagtccttctaaccgaggtcgaaacgtacgttctctcta  
tcatcccgtcaggccccctcaaagccgagatcgacagagacttgaagat  
gtctttgcaggggaagaacaccgatcttgaggttctcatggaatggctaaa  
gacaagaccaatcctgtcacctctgactaaggggattttaggatttgtgt  
tcacgctcacggtgcccgtagcgaggactgcagcgtagacgctttgtc  
caaatgcccttaatgggaacggggatccaaataacatggacaaagcagt  
taaactgtataggaagctcaagagggagataacattccatggggccaaag  
aatctcactcagttattctgctggtgcacttgccagttgtatgggcctc  
atatacaacaggatgggggctgtgaccactgaagtggcatttggcctggt  
atgtgcaacctgtgaacagattgctgactcccagcatcggtctcataggc  
aaatggtgacaacaaccaaccactaatcagacatgagaacagaatggtt  
ttagccagcactacagctaaggctatggagcaaatggctggatcgagtga  
gcaagcagcagaggccatggaggttgctagtcaggctaggcaaatggtgc  
aagcgatgagaaccattgggactcatcctagctccagtgctggtctgaaa  
aatgatcttcttgaaaatttgaggcctatcagaaacgaatgggggtgca  
gatgcaacgggttcaagtgaactag

Fig. 1B

Influenza matrix: protein sequence

MSLLTEVETYVLSIIPSGPLKAEIAQRLEDVFAGKNTDLEVLMEWLKTRP  
ILSPLTKGILGFVFTLTVPSEGLQRRRFVQNALNGNGDPNNMDKAVKLY  
RKLKREITFHGAKEISLSYSAGALASCMGLIYNRMGAVTTEVAFGLVCAT  
CEQIADSQHRSHRQMVTTTNPLIRHENRMVLASTTAKAMEQMAGSSEQAA  
EAMEVASQARQMVQAMRTIGTHPSSSAGLKNDDLLENLQAYQKRMGVQMQR  
FK\*

Fig. 1C

Influenza matrix: gene with increased G/C content

agatctaagatgagCctGctGaccgaggtGgaGacCtacgtGctGAGCa  
tcatcccCAGCggccccctGaaGgccgagatcgcCagagGctGgaGgaC  
gtGttCgcCggCaagaacaccgaCctGgaggtGctGatggaGtggctGaa  
gacCagGccCatcctgAGCccCctgacCaagggCatCCTGggCttCgtgt  
tcacCctGaccgtgcccagCgagcgCggCctgcagcgCCGCcgcttCgtG  
caGaaCgccctGaaCggCaacggCgaCccCaaCaacatggacaaGgcCgt  
GaaGctgtaCaggaagctGaagagggagatCacCttccaCggCgcaaGg  
aGatcAGCctGagCtaCAGCgcCggCgcCctGgccagCtgCatgggcctG  
atCtacaacaggatgggCgcCgtgaccacCgaGgtggcCttCggcctggt  
GtgCgcCacctgCgaGcagatCgcCgacAGCcagcaCcgCAGCcaCaggc  
aGatggtgacCacCaccaacccCctGatcagGcaCgagaacagGatggtG  
CTGgccagcacCacCgcCaagggCatggagcaGatggcCggCAGCaGCga  
gcaGgcCgcCgagggcatggaggtGgcCagCaggcCaggcaGatggtgc  
aGgcCatgagGaccatCggCacCcaCccCagcAGCagCgcCggCctgaaG  
aaCgaCctGctGgaGaaCCTGcaggcctaCcagaaGcgCatgggCgtgca  
gatgcaGcgCttcaagtgaactagt

Fig. 1D

Influenza matrix: gene for secreted form (with N-terminal  
signal sequence) with increased G/C content.

AgatctaagatgGCCGTCATGGCCCCCGCACCCCTGGTGCTGCTGCTGA  
GCGGCGCCCTGGCCCTGACCCAGACCTGGGCTagCctGctGaccgaggtG  
gaGacCtacgtGctGAGCatcatcccCAGCggccccctGaaGgccgagat  
cgcCagagGctGgaGgaCgtGttCgcCggCaagaacaccgaCctGgagg  
tGctGatggaGtggctGaagacCagGccCatcctgAGCccCctgacCaag  
ggCatCCTGggCttCgtgttcacCctGaccgtgcccagCgagcgCggCct  
gcagcgCCGCcgcttCgtGcaGaaCgccctGaaCggCaacggCgaCccCa  
aCaacatggacaaGgcCgtGaaGctgtaCaggaagctGaagagggagatC  
acCttccaCggCgcaaGgaGatcAGCctGagCtaCAGCgcCggCgcCct  
GgccagCtgCatgggcctGatCtacaacaggatgggCgcCgtgaccacCg  
aGgtggcCttCggcctggtGtgCgcCacctgCgaGcagatCgcCgacAGC  
cagcaCcgCAGCcaCaggcaGatggtgacCacCaccaacccCctGatcag  
GcaCgagaacagGatggtGCTGgccagcacCacCgcCaagggCatggagc  
aGatggcCggCAGCaGCgagcaGgcCgcCgagggcatggaggtGgcCagC  
caggcCaggcaGatggtgcaGgcCatgagGaccatCggCacCcaCccCag  
cAGCagCgcCggCctgaaGaaCgaCctGctGgaGaaCCTGcaggcctaCc  
agaaGcgCatgggCgtgcagatgcaGcgCttcaagtgaactagt

**Fig. 1E**

Influenza matrix: mRNA with stabilisation sequences

```
GCUUGUUCUUUUUGCAGAAGCUCAGAAUAAACGCUCAACUUUGGCagauc
uaaagaugagucuuucuaaaccgaggucgaaacguacguucucucuaucauc
ccgucaggccccucaaagccgagaucgcacagagacuugaagaugucuu
ugcagggaagaacaccgaucuuagguucucauggaauaggcuaaagacaa
gaccaauccugucaccucugacuaaggggaauuuaggauuuguguucacg
cucaccgugcccagugagcgaggacugcagcguagacgcuuuguccaaaa
ugcccuuaaugggaacggggauccaaaauacauggacaaagcaguuaaac
uguauaggaagcucaagaggagauaacaauccauggggccaaagaauc
ucacucaguuaauucugcuggugcacuugccaguuguaugggccucauauc
caacagggaugggggucugaccacugcaguggcauuuuggccugguaugug
caaccugugaacagauugcugacucccagcaucggucucauaggcaaaug
gugacaacaaccaacccacuaaucagacaugagaacagaauugguuuagc
cagcacuacagcuaaggcuauaggagcaaauggcuggaucgagugagcaag
cagcagaggccauggagguugcuagucaggcuaggcaaauggugcaagcg
augagaaccauugggacucauccuagcuccagugcuggucugaaaauga
ucuucuuagaaaauuugcaggccuaucagaaacgaauugggggugcagaugc
aacgguucaagugaACUAGUGACUGACUAGCCCGUGGGCCUCCCAACGG
GCCCUCUCCCCUCCUUGCACCAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
```

**Fig. 1F**

Influenza matrix: mRNA with increased G/C content and stabilisation sequences

```
GCUUGUUCUUUUUGCAGAAGCUCAGAAUAAACGCUCAACUUUGGCagauc
uaaagaugagCcuGcuGaccgagguGgaGacCuacguGcuGAGCaucauc
ccCAGCggccccuGaaGgccgagaucgcCagagGcuGgaGgaCguGuu
CgcCggCaagaacaccgaCcuGgagguGcuGauggaGuggcuGaagacCa
gGccCauccugAGCccCcuGacCaagggCauCCUGggCuuCguguucacC
cuGaccgugcccagCgagcgCggCcuGcagcgCCGCcgcuuGcuGcaGaa
CgcccGaaCggCaacggCgaCccCaaCaacauggacaaGgcCguGaaGc
uguaCaggaagcuGaagagggagauCacCuuccaCggCgcaaGgaGauc
AGCcuGagCuaCAGCgcCggCgcCcuGgccagCugCauggggccuGauCua
caacagggaugggCgcCgugaccacCgaGguggcCuuCggccugguGugCg
cCaccugCgaGcagauCgcCgacAGCcgcaCcgCAGCcaCaggcaGaug
gugacCacCaccaacccCcuGaucagGcaCgagaacagGaugguGCUGgc
cagcacCacCgcCaagggCauggagcaGauggcCggCAGCaGCgagcaGg
cCgcCgaggccauggagguGgcCagCagggCaggcaGauggugcaGgcC
augagGaccuGggCacCcaCccCagCAGCagCgcCggCcuGaaGaaCga
CcuGcuGgaGaaCCUGcaggccuaCcagaaGcgCaugggCgugcagaugc
aGcgCuucaagugaACUAGUGACUGACUAGCCCGUGGGCCUCCCAACGG
GCCCUCUCCCCUCCUUGCACCAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
```

Influenza matrix: mRNA coding for secreted form with increased G/C content and stabilisation sequences

Influenza matrix: mRNA coding for secreted form with increased G/C content and stabilisation sequences

Fig. 2A

MAGE1: wild type gene (for comparison)

```
catcatgtctcttgagcagaggagtctgcactgcaagcctgaggaagccc
ttgaggcccaacaagaggccctgggcctggtgtgtgtgcaggctgccacc
tctctctctctctctctggtcctgggcaccctggaggaggtgccactgc
tggttcaacagatcctccccagagtcctcagggagcctccgcctttccca
ctaccatcaacttcactcgacagaggcaaccagtgagggttccagcagc
cgtgaagaggaggggccaagcacctcttgatcctggagtccttggtccg
agcagtaatcactaagaaggtggctgatttggttggttttctgctcctca
aatatcgagccaggaggagccagtcacaaaggcagaaatgctggagagtgtc
atcaaaaattacaagcactgttttctgagatcttcggcaaagcctctga
gtccttgcaagctggtctttggcattgacgtgaaggaagcagacccaccg
gccactcctatgtccttgacacctgcctaggtctctcctatgatggcctg
ctgggtgataatcagatcatgcccagacaggcttcctgataattgtcct
ggtcatgattgcaatggaggggcgccatgctcctgaggaggaaatctggg
aggagctgagtgtgatggaggtgtatgatgggaggaggacacagtgccctat
ggggagcccaggaagctgctcacccaagatttggtgcaggaaaagtacct
ggagtaccggcaggtgccggacagtgatcccgacgctatgagttcctgt
gggggtccaaggccctcgctgaaaccagctatgtgaaagtccttgagtat
gtgatcaaggtcagtgcaagagttcgctttttcttcccatccctgcgtga
agcagctttgagagaggaggaagaggaggtctgagcatga
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Fig. 2B

MAGE1: protein sequence

SER, LEU, GLU, GLN, ARG, SER, LEU, HIS, CYS, LYS, PRO, GLU, GLU, ALA, LEU, GLU, ALA, GLN, GLN, GLU, ALA, LEU, GLY, LEU, VAL, CYS, VAL, GLN, ALA, ALA, THR, SER, SER, SER, SER, PRO, LEU, VAL, LEU, GLY, THR, LEU, GLU, GLU, VAL, PRO, THR, ALA, GLY, SER, THR, ASP, PRO, PRO, GLN, SER, PRO, GLN, GLY, ALA, SER, ALA, PHE, PRO, THR, THR, ILE, ASN, PHE, THR, ARG, GLN, ARG, GLN, PRO, SER, GLU, GLY, SER, SER, SER, ARG, GLU, GLU, GLU, GLY, PRO, SER, THR, SER, CYS, ILE, LEU, GLU, SER, LEU, PHE, ARG, ALA, VAL, ILE, THR, LYS, LYS, VAL, ALA, ASP, LEU, VAL, GLY, PHE, LEU, LEU, LEU, LYS, TYR, ARG, ALA, ARG, GLU, PRO, VAL, THR, LYS, ALA, GLU, MET, LEU, GLU, SER, VAL, ILE, LYS, ASN, TYR, LYS, HIS, CYS, PHE, PRO, GLU, ILE, PHE, GLY, LYS, ALA, SER, GLU, SER, LEU, GLN, LEU, VAL, PHE, GLY, ILE, ASP, VAL, LYS, GLU, ALA, ASP, PRO, THR, GLY, HIS, SER, TYR, VAL, LEU, VAL, THR, CYS, LEU, GLY, LEU, SER, TYR, ASP, GLY, LEU, LEU, GLY, ASP, ASN, GLN, ILE, MET, PRO, LYS, THR, GLY, PHE, LEU, ILE, ILE, VAL, LEU, VAL, MET, ILE, ALA, MET, GLU, GLY, GLY, HIS, ALA, PRO, GLU, GLU, GLU, ILE, TRP, GLU, GLU, LEU, SER, VAL, MET, GLU, VAL, TYR, ASP, GLY, ARG, GLU, HIS, SER, ALA, TYR, GLY, GLU, PRO, ARG, LYS, LEU, LEU, THR, GLN, ASP, LEU, VAL, GLN, GLU, LYS, TYR, LEU, GLU, TYR, ARG, GLN, VAL, PRO, ASP, SER, ASP, PRO, ALA, ARG, TYR, GLU, PHE, LEU, TRP, GLY, PRO, ARG, ALA, LEU, ALA, GLU, THR, SER, TYR, VAL, LYS, VAL, LEU, GLU, TYR, VAL, ILE, LYS, VAL, SER, ALA, ARG, VAL, ARG, PHE, PHE, PHE, PRO, SER, LEU, ARG, GLU, ALA, ALA, LEU, ARG, GLU, GLU, GLU, GLU, GLY, VAL, STP -  
, ALA, STP

Fig. 2C

MAGE1: mRNA with increased G/C content

augagccuggagcagcgcagccugcacugcaagccggaggaggcguggaggcgagcagga  
ggcgugggccuggucugcguccaggcgggcgacgagcagcagcagcccgugguccugggca  
cguggaggaggucccgacggcgggcagcacggacccgccgagagcccgagggcgcgagc  
gcuucccgacgacgaucaacuucacgcgccagcgccagccgagcagggcgagcagcagccg  
cgaggaggaggggcccgagcacgagcugcauccuggagagccuguucccgcgcggucauca  
agaaggugcgcgaccuggucggcuuccugcugcugaaguaccgcgcgcgcgagccggucacg  
aaggcgaggaguggagagcgucacuaagaacuacaagcacugcuucccgagauuuu  
caaggcgagcgagagccugcagcugguccugggccugagcuacgacggccugcuggggcgacaac  
gccacagcuacguccugguacgugccugggccugagcuacgacggccugcuggggcgacaac  
cagaucaugccgaagacgggcuuccugaucaucguccuggucaugaucgggauggaggcg  
ccacgcgcggaggaggagauucugggagagcugagcguaugaggagguuacgacggccgcg  
agcacagcgcuacggcgagccgcgcaagcugcugacgcaggaaccugguccaggagaaguac  
cuggaguaccgccaggucccgacagcgacccggcgcgcuacgaguuccuguggggcccgcg  
cgcgugggcgagacgagcuacgucuaagguccugggagguacgucuaaaggucagcgcgcg  
uccgcuucuuucccgagccugcgcgaggcgcgugcgcgaggaggaggaggggcgucuga  
gcgugauga

Fig. 2D

MAGE1: mRNA with alternative codon usage

augagccuggagcagcgcagccugcacugcaagcccgaggaggccuggaggccagcagga  
ggcccgugggccuggugugcgugcaggccgccaccagcagcagcagcccccuggugcugggca  
cccuggaggaggugcccaccgcggcgagcaccgacccccccagagccccaggggcgccagc  
gccuuccccaccaccauacaacuucacccgccagcgccagcccgagggcgagcagcagccg  
cgaggaggaggggcccgacaccagcugcauccuggagagccuguuccgcgcgugaucacca  
agaaggugggccgaccuggugggcuuccugcugcugaaguaccgcgcccgcgagcccgugacc  
aaggccgagauugcuggagagcgugaucaagaacuacaagcacugcuuccccgagauuuu  
caaggccagcgagagccugcagcugguuucggcaucgacgugaaggaggccgacccaccg  
gccacagcuacgugcuggugaccugccugggccugagcuacgacggccugcuggggcgacaac  
cagaucaugcccaagaccggcuuccugaucaucgugcugguugaugaucgccauggaggcg  
ccacgccccgaggaggagauucugggaggagcugagcgugauggaggguuacgacggccgcg  
agcacagcgccuacggcgagccccgcaagcugcugacccaggaccuggugcaggagaaguac  
cuggaguaccgccaggugcccgcagcgaccccgcccgcuaacgaguuccuguggggccccc  
cgcccgugggcgagaccagcuacgugaaggugcuggagauacgugaaucaaggugagcgccgcg  
ugcgcuucuuucccgagccugcgcgaggccggccugcgcgaggaggaggaggggcguguga  
gccugauga